# XXI. *Studies of the* Blattidæ (*continued*).

By R. Shelford, M.A., F.L.S.

[Read November 21st, 1906.]

## Plate XXX.

## V. The types of *Blattidæ* described by Francis Walker, and now in the Hope Museum, Oxford.

These types are all contained in the collection of Mr. W. W. Saunders which was presented in 1873 to the Oxford Museum by Mrs. F. W. Hope; the new species in this collection were described by Walker in his "Catalogue of Blattariæ" (1868); and in a supplementary volume, "Catalogue of Dermaptera Saltatoria and Blattariæ," published in 1869.

Owing to the inadequacy of Walker's descriptions and to his elastic views of generic limitations many of his species can only be recognized by those who have access to his types. A careful revision of Walker's work on *Blattidæ* is urgently needed, and the notes here presented are a first contribution towards a complete revision; thanks to Mr. Kirby's "Synonymic Catalogue of Orthoptera," vol. i (1904), the task has not proved so difficult as might have been expected. The species are discussed here not in the order in which they were arranged by Walker, but in the order that they take in modern and received systems of classification of the *Blattidæ*. Wherever it has appeared necessary the species have been re-described, but in some cases Walker's descriptions are quite recognizable, once the generic positions of his species have been fixed.

## Family BLATTIDÆ.

### Sub-fam. *ECTOBIINÆ.*

1. *Theganopteryx apicigera*, Wlk.

   *Blatta apicigera*, Walker. Cat. Blatt. B. M. p. 227 (1868).
   *Theganopteryx apicigera*, Shelford, Trans. Ent. Soc. (1906), p. 235.

   ♀. Java (*Wallace*).

2. *Escala circumducta*, Wlk.

   *Blatta circumducta*, Walker. Cat. Blatt. B. M. Suppl. p. 142 (1869).
   *Escala circumducta*, Shelford, Trans. Ent. Soc., p. 239, Pl. XV, f. 4 (1906.)

   ♂. S. Australia.

3. *Escala longiuscula*, Wlk.

   *Blatta longiuscula*, Walker, l. c. p. 143 (1869).
   *Escala longiuscula*, Shelford, l. c. p. 239. Pl. XV, f. 5 (1906).

   ♂. S. Australia.

4. *Hemithyrsocera fissa*, Wlk.

   *Pseudomops fissa*, Walker, l. c. p. 213 (1868).

   ♂. Sumatra (*Wallace*).

This is synonymous with *H. histrio*, Burm. (cf. Trans. Ent. Soc. 1906, p. 238.)

### Sub-fam. *PHYLLODROMIINÆ.*

5. *Pseudomops inclusa*, Wlk.

   *Pseudomops inclusa*, Walker, l. c. p. 212 (1868).
   *Thyrsocera amœna*, de Saussure, Mél. Orthop. IV, p. 97 (1872).

   ♂. Brazil.

6. *Pseudothyrsocera pica*, Wlk.

   *Pseudomops pica*, Walker, l. c. p. 213 (1868).
   *Pseudothyrsocera pica*, Shelford, l. c. p. 250 (1906).

   ♂. Singapore (*Wallace*). ♀. Sumatra (*Wallace*).

7. *Pseudothyrsocera scutigera*, Wlk.

*Pseudomops scutigera*, Walker, l. c. p. 212 (1868).

♂. Sarawak (*Wallace*).

8. *Pseudothyrsocera xanthophila*, Wlk. (Plate XXX, figs. 1 and 2).

*Blatta xanthophila*, Walker, l. c. p. 230 (1868).

♂. Menado, Celebes (*Wallace*).

Fulvous. Antennæ black, slightly incrassated in basal half and hirsute; apex of maxillary palpi black. Pronotum trapezoidal, covering vertex of head. Tegmina with thirteen costal veins, discoidal field with seven longitudinal sectors, three of which are given off from the anterior ulnar branch, four from the posterior ulnar, the latter are strongly angled. Supra-anal lamina triangular, produced, the posterior angles bear each a short downwardly directed spine; sub-genital lamina produced, narrow, covered with a dense pile of long hairs, asymmetrical, the left posterior angle strongly produced, no styles.

Total length 13 mm.; length of tegmina 10·8 mm.

9. *Ischnoptera reversa*, Wlk.

*Ischnoptera reversa*, Walker, l. c. p. 147 (1869).

♂. Singapore (*Wallace*).

Rufo-castaneous. Basal half of antennæ, terminal joints of maxillary and labial palpi, fuscous. Pronotum trapezoidal, sides deflexed, not covering vertex of head. Tegmina with nineteen costal veins, discoidal field with ten longitudinal sectors. Wings with the mediastinal vein three-branched, radial vein unbranched, twelve costal veins, ulnar vein with nine branches, three of which go towards the dividing vein. Supra-anal lamina triangular, sub-genital lamina ample, its border notched, two styles. Legs with the genicular angles of the femora, the tibæ and tarsi fuscous, all the femora with genicular spines, formula of apical spines, ½, ½, ½, anterior margin of front femora with numerous spines, the more distal short and closely set.

Total length 20 mm.; length of body 13 mm.; length of tegmina 15 mm.

10. *Ischnoptera erythrina*, Wlk.

*Blatta erythrina*, Walker, l. c. p. 219 (1868).

♀. Brazil.

This is synonymous with *Ischnoptera rufa*, Br.

11. *Phyllodromia colligata*, Wlk.

*Blatta colligata*, Walker. l. c. p. 221 (1868).
*Phyllodromia bisignata*, Brunner, Ann. Mus. Civ. Gen. xxxiii, p. 15, pl. 1. f. 1 (1893).

The type, which is in a very fragmentary condition, is from Amoy.

12. *Phyllodromia amplectens*, Wlk.

*Blatta amplectens*, Walker, l. c. p. 223 (1868).

Sex ? (abdomen lost). Morty (*Wallace*).

Fulvous. Pronotum with a fuscous horseshoe-shaped marking, the limbs of the horseshoe directed forward and not attaining the anterior border of the pronotum. Tegmina with sixteen costal veins, discoidal field with eight longitudinal sectors.

Total length 16·2 mm. ; length of tegmina 13 mm.

13. *Phyllodromia funebris*, Wlk.

*Blatta funebris*, Walker, l. c. p. 225 (1868).

♂. Sarawak (*Wallace*).

Pronotum not covering vertex of head, trapezoidal, sides scarcely deflexed, margined. Tegmina with twelve costal veins, the last three bifurcated. Supra-anal lamina triangular, sub-genital lamina ample, its posterior border slightly emarginate. Anterior border of front femora with three long spines in the middle, numerous piliform spines distally.

Near *P. lycoides*, Wlk., from India.

14. *Phyllodromia hamifera*, Wlk.

*Blatta hamifera*, Walker, l. c. p. 224 (1868).

♂. Sarawak (*Wallace*).

The species is allied to *P. variegata*, Br., from Java. Walker's description sufficiently illustrates its differences from that species.

15. *Phyllodromia contingens*, Wlk. (Plate XXX, fig. 4.)

*Blatta contingens*, Walker, l. c. p. 229 (1868).
*Blatta humeralis*, Walker, l. c. p. 140 (1869).

♂. (*humeralis*) Singapore (*Wallace*).
♀. (*contingens*) Sarawak (*Wallace*).

Flavo-testaceous. Antennæ longer than total length. Pronotum transversely elliptical, lateral margins hyaline, posterior border not produced. Lateral margins of tegmina broadly hyaline, mediastinal area areolated, eleven costal veins. Supra-anal lamina of male shortly produced, trigonal, sub-genital lamina with the posterior angles produced to form two setiform processes, the styles situated in deep notches; supra-anal lamina of female short, transverse, sub-genital lamina ample, semi-orbicular.

♂. Total length 13 mm.; length of body 10 mm.; length of tegmina 10 mm.

♀. Total length 15 mm.; length of body 10 mm.; length of tegmina 12·8 mm.

16. *Phyllodromia sequens*, Wlk.

*Blatta sequens*, Walker, l. c. p. 229 (1868).

Sex? (abdomen lost). Macassar, Celebes (*Wallace*).

Fulvo-testaceous; head not covered by pronotum, which is elliptical, and slightly produced behind, its lateral margins pellucid. Tegmina with eleven costals, anterior ulnar with four branches, posterior ulnar simple. Front femora with 8 long spines on the anterior margin beneath, all the femora with genicular spines, formula of apical spines ½, ½, ½. Total length 13·2 mm.; length of tegmina 11 mm.

17. *Phyllodromia virescens*, Wlk.

*Blatta virescens*, Walker, l. c. p. 231 (1868).

♀. Sarawak (*Wallace*).

The species is readily recognizable by its pale green colour. Small; pronotum not covering vertex of head, trapezoidal, margins broadly hyaline. Tegmina hyaline, eleven to twelve costals, discoidal sectors oblique. Supra-anal lamina trigonal, sub-genital lamina ample, cerci elongate. Front femora with close-set piliform spines on anterior margin.

18. *Phyllodromia suffusa*, Wlk.

*Blatta suffusa*, Walker, l. c. p. 223 (1868).

Sex? (tip of abdomen mutilated). New Guinea (*Wallace*).

Flavo-testaceous. Antennæ flavo-testaceous at base, terminal half fuscescent, basal half fuscous. Pronotum trapezoidal, not covering vertex of head, lateral margins pellucid, sides not deflexed,

posterior margin straight. Tegmina with ten costal veins, anterior ulnar with five oblique branches, posterior ulnar simple. Wings with eleven costals their apices incrassated, ulnar vein with three branches. Front femora armed on the anterior margin beneath with minute piliform spines, armature of the other femora very sparse; no genicular spine on anterior femora.

19. *Phyllodromia laterifera*, Wlk.

*Blatta laterifera*, Walker, l. c. p. 231 (1868).

♀. Sarawak (*Wallace*).

20. *Phyllodromia propinqua*, Wlk.

*Blatta propinqua*, Walker, l. c. p. 228 (1868).
*Blatta contigua*, Walker, l. c. p. 228 (1868).

♀. (*propinqua*). Macassar, Celebes (*Wallace*).
♀. (*contigua*). New Guinea (*Wallace*).

21. *Phyllodromia majuscula*, Wlk.

*Blatta majuscula*, Walker, l. c. p. 139 (1869).

♀. Chan-ti-bon, Siam (*Mouhot*).

These three species are all large testaceo-hyaline forms with broadly elliptical pronotum, broad tegmina with the marginal area equalling half the total breadth. They may be distinguished by the form of the supra-anal lamina:—

*a*. Supra-anal lamina triangular and cleft at the apex; total length 17 mm. . . . . *P. propinqua*.
*aa*. Supra-anal lamina not cleft at the apex.
*b*. Supra-anal lamina short, transverse; total length 18 mm. . . . . *P. laterifera*.
*bb*. Supra-anal lamina, slightly produced, trigonal; total length 21 mm. . . . . *P. majuscula*.

22. *Phyllodromia elegans*, Wlk.

*Blatta elegans*, Walker, l. c. p. 226 (1868).

♂. Sarawak (*Wallace*).

23. *Phyllodromia picticollis*, Wlk.

*Blatta picticollis*, Walker, l. c. p. 140 (1869).

♀. Macassar, Celebes (*Wallace*).

24. *Phyllodromia guttifera*. Wlk.

*Blatta guttifera*, Walker, l. c. p. 230 (1868).

♂. Aru Is. (*Wallace*).

This and the two preceding species are all very closely allied. They are fulvo-testaceous insects about 17 mm. in total length with very long slender antennæ and with the tegmina projecting considerably beyond the end of the body; the venation of the tegmina is the same in all species, there being twenty to twenty-one costal veins, eight discoidal longitudinal sectors and the radial vein is bifurcated.

The following may be considered the differential characters of the three species:

| | |
|---|---|
| Pronotum with disc fusco-castaneous, a W-shaped mark and central line testaceous, margins testaceous. Coxæ not spotted. Supra-anal lamina narrow, produced, triangular; sub-genital lamina irregular, deeply cleft; titillator nearly straight . . . . . | *P. elegans* |
| Pronotum with disc rufo-castaneous, a dumb-bell-shaped mark and margins testaceous. Coxæ not spotted. Supra-anal lamina incised at apex . . . | *P. picticollis.* |
| Pronotum fulvous with irregular paler marking on disc. Coxæ spotted with castaneous. Supra-anal lamina broad, produced, triangular; sub-genital lamina narrow, not cleft; titillator strongly curved | *P. guttifera.* |

25. *Phyllodromia polygrapha*, Wlk.

*Blatta polygrapha*, Walker, l. c. p. 222 (1868).

Sex? (abdomen missing).

Chan-ti-bon, Siam (*Mouhot*).

This is closely allied to *P. hieroglyphica*, Br. but the head and pronotum are much more heavily marked with castaneous and the femora have their posterior margins marked with fuscous.

26. *Phyllodromia obtusifrons*, Wlk.

*Blatta obtusifrons*, Walker, l. c. p. 226 (1868).

♀. Sarawak (*Wallace*).

Fulvo-testaceous. Head castaneous, antennæ twice as long as the body. Pronotum trapezoidal, barely covering vertex of head, posterior margin very slightly angled, sides only slightly deflexed,

disc marked with castaneous dots and lines symmetrically arranged. Tegmina with marginal field equalling half the total breadth, radial vein bifurcated, the lower branch ramose and sending its branches to the apical part of the anterior margin, eleven costals, anterior ulnar with five branches, posterior ulnar simple. Ulnar vein of wings with four branches. Supra-anal lamina shortly produced; subgenital lamina ample, semi-orbicular; cerci elongate. Insertions of tibial and femoral spines marked with fuscous.

27. *Phyllodromia ignobilis*, Wlk.

*Blatta ignobilis*, Walker, l. c. p. 224 (1868).

♀. Sula Is. (*Wallace*).

This is a small species, which can be recognized by the colouring of the tegmina; in these the veins are pale and the interstices filled with flavo-testaceous, in addition there are numerous castaneous points situated on the veins. The costal veins of the wing are somewhat irregular and their ends are clavate, they are ten in number, the ulnar vein has three branches and there is a prominent triangular apical area. The anterior margin of the front femora beneath are armed only with minute and close-set piliform spines.

28. *Phyllodromia marmorata*, Wlk.

*Blatta marmorata*, Walker, l. c. p. 140 (1869).

♀. Mt. Ophir, Malacca (*Wallace*).

A pale testaceous species, marbled with castaneous; evidently a cryptic coloration.

29. *Phyllodromia extenuata*, Wlk.

*Blatta extenuata*, Walker, l. c. 221 (1868).

♂. Egypt.

This is synonymous with *P. supellectilium*, Serv.

30. *Phyllodromia annulicornis*, Wlk.

*Blatta annulicornis*, Walker, l. c. p. 219 (1868).

♂. Para, Brazil.

Head black, shining; eyes pale; antennæ fuscous, with a testaceous annulus occupying eight joints, before the middle. Pronotum black, shining, with the posterior and lateral margins pale testaceous, not covering vertex of head, posterior margin slightly produced.

Tegmina rufo-testaceous, infuscated at base, fifteen costal veins, discoidal field reticulated. Abdomen and legs black, tibial spines and apical tarsal joints rufous. Sub-genital lamina small, narrow, quadrate, with two styles.

31. *Pseudectobia bipunctata*, Wlk. (Plate XXX, fig. 3.)

*Blatta bipunctata*, Walker, l. c. p. 141 (1869).

♀. Macassar, Celebes (*Wallace*).

The species is rather convex, the marginal field of the tegmina is broad, the veins of the discoidal field are very indistinct, a triangular apical area is present in the wings, the supra-anal lamina is short and transverse and the femora are sparsely armed, which characters taken in conjunction may be considered as diagnostic of the genus *Pseudectobia*.

32. *Pseudophyllodromia laticeps*, Wlk.

*Blatta laticeps*, Walker, l. c. 142 (1869).
*Phyllodromia laticapnt*, Brunner, Abhandl. Senckenb. Ges. xxiv, p. 205, pl. 16, f. 9 (1898).

♀. Singapore (*Wallace*).

In Singapore examples the disc of the abdomen beneath is testaceous, whereas in examples from Borneo (= *laticapnt*, Br.) this is rufous, otherwise the two forms are identical.

33. *Allacta latirupta*, Walk.

*Blatta mundicola*, Walker, l. c. p. 101 (1868).
*Blatta latirupta*, Walker, l. c. p. 143 (1869).
*Blatta patula*, Walker, l. c. p. 143 (1869).
*Blatta bitæniata*, de Saussure, Mél. Orthopt. II, p. 63 (1869).

♂. (= *latirupta*, Wlk.) New South Wales.
♀. (= *patula*, Wlk.) Sydney.

*A. mundicola*, Wlk. is the earliest name for this species.

34. *Duryodana palpalis*, Wlk.

*Blatta palpalis*, Walker, l. c. p. 225 (1868).
*Phyllodromia palpata*, Brunner, Abhandl. Senckenb. Ges. xxiv, p. 207, pl. 16, f. 13 (1898).

♂. Sarawak (*Wallace*).

Sub-fam. *EPILAMPRINÆ*

35. *Pinaconota obliqua*, Wlk. (Plate XXX, fig. 5.)

*Ischnoptera (?) obliqua*, Walker, l. c. 148 (1869).

♂. BRAZIL.

Pale testaceous. Head castaneous, a fuscous band between the eyes, clypeus and mouth-parts testaceous, sparsely but deeply punctate; antennæ about half the body-length, testaceous. Pronotum transversely elliptical, anterior margin truncate, not nearly covering vertex of head; posterior margin nearly straight, sides deflexed, with large scattered punctures; two angulate black vittæ extend from the anterior to the posterior margins. Tegmina with basal fourth punctate, a short humeral stripe castaneous, radial vein bifurcated, extremities ramose, ten costal veins, discoidal field reticulate. Scutellum exposed, marked with castaneous, punctate. Supra-anal lamina large, fimbriated; sub-genital lamina large with two styles asymmetrically placed; cerci short; legs short, the front and mid tibiæ shorter than the corresponding femora. Front femora armed on the anterior margin beneath with a close-set row of short spines, two spines on the posterior margin; mid-femora with twelve spines on anterior, four on posterior margin; hind-femora with five spines on anterior, four on posterior margin beneath; the spines on the anterior margin about half the length of those on the posterior margin; formula of apical spines $\frac{3}{3}$, $\frac{1}{1}$, $\frac{1}{1}$; minute genicular spines on mid- and hind-femora. Tarsi short, both tibiæ and tarsi fimbriated, posterior metatarsus shorter than remaining joints; pulvilli large. Total length 21 mm.; length of body 18 mm.; length of tegmina 17 mm.; pronotum 5 mm. × 7 mm.

This somewhat remarkable species appears to be undoubtedly referable to the genus *Pinaconota*, Sauss., it can be distinguished from the only other species in the genus, *P. bifasciata*, Sauss., by its much larger size.

36. *Molytria dotata*, Wlk.

*Epilampra dotata*, Walker, l. c. p. 130 (1869).

♀. SINGAPORE (*Wallace*).

The same as *Molytria badia*, Br.

37. *Molytria polyspila*, Wlk.

*Epilampra polyspila*, Walker, l. c. p. 197 (1868); l. c. p. 133 (1869).

♂. Singapore (*Wallace*); ♀. Sarawak (Wallace).

This is synonymous with *M. maculata*, Br.; *M. shelfordi* Kirby, is merely the Bornean race.

38. *Molytria ramifera*, Wlk.

*Epilampra ramifera*, Walker, l. c. p. 132 (1869).

♂. Sumatra (*Wallace*).

The species is very close, perhaps too close to *M. badia*, Br.; it differs by the paler colour of the pronotum and tegmina, by the more rufous coloration of the abdomen and legs, by the narrower pronotum (11 mm. × 14·5 mm. as against 11 mm. × 17 mm. in *badia*) and by the more ample subgenital lamina and more spatulate styles.

39. *Homalopteryx basifera*, Wlk.

*Epilampra basifera*, Walker, l. c. p. 131 (1869).

♂. Ceram (*Wallace*).

Synonymous with *H. macassariensis*, Haan.

40. *Homalopteryx adusta*, Wlk. (Plate XXX, fig. 6.)

*Epilampra adusta*, Walker, l. c. p. 131 (1869).

♀. Sarawak (*Wallace*).

Head testaceous, a cruciform castaneous marking on the front, vertex with small castaneous points, apex of maxillary palpi castaneous. Pronotum with the disc castaneous, the lateral margins broadly testaceous, marked with numerous castaneous points, the surface granular, two impressions on the disc, black, lateral margins slightly reflected, posterior margin with a row of larger granules. Tegmina testaceous heavily mottled with castaneous, marginal area paler, serio-punctate, just failing to reach extremity of abdomen. Abdomen beneath with the disc heavily mottled with castaneous, margins testaceous; supra-anal lamina bilobate, sub-genital lamina ample; cerci testaceous. Legs testaceous, dotted with castaneous, four spines on anterior margin of front femora, formula of apical spines $\frac{1}{0}$, $\frac{1}{1}$, $\frac{1}{0}$, no genicular spine on front femora; posterior metatarsus shorter than remaining joints, spinous beneath, pulvillus not produced backwardly. Total length 23 mm.; length of tegmina 17 mm.; pronotum 8·5 mm. × 12 mm.

41. **Pseudophoraspis conformis*, Wlk.

*Epilampra conformis*, Walker, l. c. p. 200 (1868).
*Epilampra scita*, Walker, l. c. p. 200 (1868).

♀. Sarawak (*Wallace*). "From the stomach of a cuckoo, *Phœnicophœus erythrognathus*" [*conformis*].
♀. Sumatra (*Wallace*) [*scita*].

Both these species and also *P. congrua*, Wlk., are the same and synonymous with *P. nebulosa*, Burm. The species is highly variable both in size and coloration, but the study of a long series from all the greater Sunda Is. convinces me that there is no character that can be relied on to discriminate distinct species; the Bornean race is generally larger and with the veins of the marginal area of the tegmina more strongly marked; but even these characters are not constant.

42. *Hedaia concinnula*, Wlk.

*Epilampra concinnula*, Walker, l. c. p. 134 (1869).

♀. Timor (*Wallace*).

The species is very close to *H. procera*, Br., but differs in the more heavily armed front femora, the sinuate tip of the wing and more mottled coloration of the tegmina.

43. *Hedaia parvicollis*, Wlk.

*Epilampra parvicollis*, Walker, l. c. p. 133 (1869).

♂. Sarawak (*Wallace*).

Very like *H. procera*, Br., but the pronotum is much smaller, measuring 7 mm. × 8·5 mm., its anterior angles are less rounded, its anterior margin less arcuate, so that in general appearance it is more like a heraldic shield than is usual in the genus *Hedaia*. The posterior margin of the subgenital lamina is sinuate and from the slightly produced posterior angles spring the slender styles.

44. *Epilampra inclarata*, Walk.

*Epilampra inclarata*, Walker, l. c. p. 198 (1868).

♀. Sarawak (*Wallace*).

* This genus is very badly defined, but the genus *Epilampra* is already so unwieldy that one is induced to welcome any attempt to split it up.

Allied to *E. sarawacensis*, Shelf. Testaceous; the ground-colour however obscured by a dense castaneous maculation and vermiculation. Pronotum not covering vertex of head, not punctate, posterior margin angulate, 9·5 mm. × 13 mm. Large ocelliform spots on the distal halves of the tegmina; mediastinal vein stout with three short branches and one slender ramose branch, costals few but highly ramose; surface of tegmina not punctate. Wings with marginal field semi-coriaceous and suffused with castaneous, apex not sinuate or angulate. Sub-genital lamina produced, trigonal. Front femora beneath with eight spines on anterior margin, two on posterior margin, no genicular spine; formula of apical spines $\frac{2}{1}$, $\frac{1}{1}$, $\frac{1}{1}$.

45. *Epilampra plena*, Wlk.

*Epilampra plena*, Walker, l. c. p. 211 (1868).
*Epilampra fervida*, Walker, l. c. p. 211 (1868).

♀. Macassar, *Celebes* (Wallace) [*plena*].
♀. Macassar, *Celebes* (Wallace) [*fervida*].

*E. plena*, Wlk.; *E. puncticollis*, Wlk.; *E. quadrinotata*, Wlk.; *E. lævicollis*, Sss., and *E. flavomarginata*, Shelf. form a congeries of species that it is not easy to discriminate; the differences in coloration are slight, and it is almost impossible to express them in writing. The species are small, averaging 25 mm. in total length; they are amber-coloured or testaceous, the ground-colour however being obscured by densely placed and minute castaneous or fuscous maculæ, and vermiculatious, so that the insects appear to be of some shade of castaneous. The pronotum does not cover the vertex of the head, its posterior margin is obtusely angled and produced, its surface is quite smooth. The posterior legs are long and slender, the metatarsus particularly so, and the pulvilli are margined with spines. The veins of the tegmina are strongly marked, and between them at the base only of the tegmen appear series of shallow ill-marked punctures. *E. puncticollis*, Wlk., from Borneo can be distinguished by two converging impressions on the front part of the pronotum; *E. lævicollis*, Sss., from Java is possibly synonymous; *E. quadrinotata*, Wlk., from Borneo is smaller (20 mm. total length), has four fuscous maculæ on the pronotum, and the supra-anal lamina is notched deeply, not merely cleft; *E. plena*, Wlk., from Celebes and New Guinea has no impressions on the pronotum and is larger than *quadrinotata*, the form *fervida*

is less heavily marked and is of a rufous hue; *E. flavomarginata*, Shelf., can be distinguished by its coloration. A revision of the genus *Epilampra* is much to be desired, but without a comparison of all the types it is a matter of such consummate difficulty that it has been shirked by every student of the Blattidæ. The species noted above might well be considered typical of Kirby's genus *Heterolampra*, but Mr. Kirby in his Synonymic Catalogue of Orthoptera includes in it all the old world species of *Epilampra* that cannot be fitted into the genera *Hedaia* and *Calolampra*; the result is a heterogeneous assemblage, whose diagnostic generic characters are in most cases merely their locality labels.

46. *Epilampra varia*, Wlk. (Plate XXX, fig. 9.)

*Epilampra varia*, Walker, l. c. p. 130 (1869).

♀. Sarawak (*Wallace*).

Head flavo-testaceous, with a large black patch covering nearly the whole of the front from between the eyes to the labrum, vertex mottled with castaneous; antennæ broken; eyes pale. Pronotum not covering vertex of head, its posterior margin truncate, sides deflexed, smooth, shining, dark castaneous, all the margins flavo-testaceous, spotted with castaneous. Tegmina short, reaching only to the middle of the penultimate segment, coriaceous, smooth and shining, the venation obsolescent, the anal and axillary veins being entirely absent; serio-punctate, the punctures indicating the obsolescent venation; flavo-testaceous heavily marked with castaneous, the part of the right tegmen overlapped by the left castaneous, its surface reticulated. Wings equalling in length the tegmina, marginal area coriaceous. Supra-anal lamina not markedly bilobate, its posterior margin merely notched slightly; sub-genital lamina ample; cerci short, flavid. Legs mottled with castaneous; front femora with three stout spines on anterior margin beneath, one on posterior margin; formula of apical spines $\frac{2}{1}$, $\frac{1}{1}$, $\frac{1}{1}$.

Total length 28·5 mm.; length of tegmina 20 mm.; pronotum 8·5 mm. × 11 mm.

This species, together with *E. imitans*, Br., and an undescribed species from the Malay Peninsula, might constitute a new sub-genus, distinguished by the reduced

wings and tegmina and the truncate or shortly produced posterior margin of the pronotum; they are smooth shining insects somewhat ovate in form.

Sub-fam. *BLATTINÆ*.

47. *Methana oculata*, Wlk.

*Periplaneta oculata*, Walker, l. c. p. 152 (1869).

♀. AUSTRALIA.

Synonymous with *Methana soror*, Sss.

48. *Pelmatosilpha aterrima*, Wlk.

*Periplaneta aterrima*, Walker, l. c. p. 151 (1869).
*Pelmatosilpha præstans*, Dohrn. Stett. Ent. Zeit. xlviii, p. 411 (1887).

♂. PERU.

Kirby regards *P. aterrima*, Wlk., as synonymic with *Nyctibora tenebrosa*, Wlk. (Syn. Cat. Orth. I, p. 108, 1904); this is certainly erroneous, as *tenebrosa* is a true *Nyctibora*.

49. *Thyrsocera speciosa*, Wlk.

*Ellipsidium speciosum*, Walker, l. c. p. 214 (1868).
*Thyrsocera speciosa*, Shelford. Trans. Ent. Soc., 1906, p. 249, Pl. xiv, fig. 5.

♀. "EASTERN ARCHIPELAGO" (*Wallace*).

Sub-fam. *PANCHLORINÆ*.

50. *Leucophæa conferta*, Wlk.

*Ischnoptera conferta*, Walker, l. c. p. 148 (1869).

♂. CHAN-TI-BON, SIAM (*Mouhot*).

Testaceous. Head with large castaneous marking on the front, extending to base of clypeus. Pronotum punctate, disc with a large castaneous lyrate mark, margins hyaline. Tegmina serio-punctate at base, testaceo-hyaline, veins castaneous; both tegmina and wings extend considerably beyond apex of abdomen. Sub-genital lamina shortly transverse, an asymmetrical projecting lobe on the right side. Legs testaceous, femora marked with castaneous towards apex.

51. *Tribonium guttulosum*, Wlk.

*Nauphœta guttulosa*, Walker, l. c. p. 184 (1868).

♀. Brazil.

Allied to *T. elegans*, Br., but much larger, head entirely black, apical half of antennæ fulvous, pronotum and tegmina more heavily marked, abdomen and legs darker.

52. *Stenoblatta paralella*, Wlk. (Plate XXX, figs. 7, 7a.)

*Stenoblatta paralella*, Walker, l. c. p. 193 (1868).

3 ♀♀. Brazil.

This extraordinary linear and flattened cockroach has apparently not been met with since Walker's description of it appeared. Walker placed it in his family *Hypnormidæ* (= *Plectopterinæ*) and Kirby (Syn. Cat. Orth. I, p. 179) places it at the end of the *Plectopterinæ*; but since the wings do not possess a triangular intercalated area this classification is evidently wrong; the large, produced supra-anal lamina with notched margin and the presence of large arolia between the tarsal claws fix the position of the genus amongst the *Panchlorinæ* of which sub-family, it may be considered an aberrant member.

Walker's description, so far as it goes, is quite accurate, except in his determination of the sex of the specimens, and the following may be regarded as merely supplementary to it:—

Head much flattened, the vertex between the eyes forming a sharp edge, semicircular in outline, eyes very narrow. Tegmina punctate at base, radial vein very straight, bifurcate, the lower branch ramose, costals numerous, obsolete and irregular, five discoidal sectors, discoidal field reticulated, nine axillary veins. Wings with anterior half flavid, posterior field infuscated, costal veins highly irregular and reticulated, median vein quite straight, ulnar vein with five branches, two of which go to the dividing vein. Supra-anal lamina projecting considerably beyond the sub-genital lamina; cerci equal in length to supra-anal lamina. Legs very short, femora without spines, tibiæ very sparsely spined, the front pair with four apical spines only, hind pair with a few in a double row on the upper border, two only on the lower border and four apical spines. Arolia relatively enormous, tarsi only half-length of tibiæ, which are two-thirds length of femora, metatarsus not longer than the following three joints, shorter than the last joint.

53. *Oniscosoma punctosa*, Wlk.

*Ischnoptera* (?) *punctosa*, Walker, l. c. p. 149 (1869).
*Ischnoptera punctuosa*, Tepper, Tr. R. Soc. S. Austral. xvii, p. 55 (1893).
*Pseudopanchlora punctosa*, Kirby, Syn. Cat. Orth. i, p. 189 (1904).

♂. AUSTRALIA.

Head castaneous, darkest on the frons which is very concave; ocelli testaceous; eyes wide apart; on the vertex a longitudinal carina testaceous in colour; antennæ mutilated, fuscous. Pronotum cucullate, an anterior carina, two converging impressions posteriorly; its surface covered with granules, anterior margin slightly reflexed, posterior margin angulate; testaceous with castaneous mottlings and a quadrate castaneous patch on posterior part of disc. Tegmina testaceous, mottled with castaneous, six to seven costal veins. Wings hyaline, venation as in *O. granicollis*, Sss. Abdomen above testaceous, below testaceous with a castaneous patch on the disc; supra-anal lamina short not projecting so far as the sub-genital lamina; cerci short.

Length of body 11 mm.; length of tegmina 10·4 mm.

There is really nothing to prevent the inclusion of this genus in the sub-family *Perisphæriinæ*; the sexual dimorphism debars it from occupying a natural position in the *Panchlorinæ*.

Sub-fam. *CORYDIINÆ*.

54. *Corydia dasytoides*, Wlk.

*Euthyrrapha dasytoides*, Walker, l. c. p. 191 (1868).
*Corydia tonkinensis*, Kirby, A.M.N.H. (7) xi, p. 405 (1903).

♀. AMOY.

Walker regarded as a variety of this species, another species from Siam which is evidently quite distinct, being the same as *C. ænea*, Br.; it is a ♀ collected by Mouhot.

The genus *Corydia* includes five closely allied species, some of which may possibly be regarded later as mere geographical races of one species; unfortunately the insects are rare in collections and additional examples are required before the exact relationships that they bear one to another can be elucidated. The following key will help in the identification of the species.

1. Tegmina crossed by an orange band.
   2. The band interrupted . . . . . *purpuralis*, Kirby (S. W. Fokien)
   2′. The band not interrupted . . . . *dasytoides*, Wlk. (Amoy, Tonkin)

1′. Tegmina not crossed by an orange band but with an orange costal patch.
   2. Apex of tegmina yellow . . . . . *hilaris*, Kirby (Hab. ?)
   2′. Apex of tegmina not yellow.
      3. Abdomen orange with blue tip . . *cærulea*, Shelf. (Borneo)
      3′. Abdomen blue-black with marginal orange vittæ . . . . . *ænea*, Br. (Burma)

55. *Euthyrrhapha ipsoides*, Wlk.

*Euthyrrhapha ipsoides*, Walker, l. c. 191 (1868).

♂. Para, Brazil.

A synonym of the widely-distributed *E. pacifica*, Coq.

56. *Holocompsa debilis*, Wlk.

*Holocompsa debilis*, Walker, l. c. p. 192 (1868).

♀. Sarawak (*Wallace*).

The only Oriental representative of the genus.

57. *Dyscologamia pilosa*, Wlk.

*Zetobora pilosa*, Walker, l. c. p. 187 (1868).

♂. Java.

Allied to *D. capucina*, Br. but larger, more rufous, pronotum anteriorly more cucullate, tegmina with only one hyaline spot in the basal third.

58. *Dyscologamia silphoides*, Wlk.

*Polyphaga silphoides*, Walker, l. c. p. 182 (1868).

♀. Cambodia (*Mouhot*).

Much larger than *D. capucina*, Br. ♀, otherwise very similar, so far as can be gathered from the description of that species.

Sub-fam. *OXYHALOINÆ*.

59. *Chorisoneura fragilis*, Wlk.

*Blatta fragilis*, Walker, l. c. p. 218 (1868).

♂. Brazil.

Synonymous with *C. nigrifrons*, Serv.

60. *Chorisoneura glabricula*, Wlk.

*Blatta glabricula*, Walker, l. c. p. 218 (1868).

♂. Brazil.

Synonymous with *C. discoidalis*, Burm.

61. *Chorisoneura calogramma*, Wlk.

*Blatta calogramma*, Walker, l. c. p. 217 (1868).

♀. Brazil.

Occiput, vertex, and centre of frons dark castaneous, a testaceous band between the eyes, traversed by a narrow black line, rest of head testaceous; antennæ testaceous, the basal joints fuscous above. Pronotum transversely elliptical, all the margins hyaline, the disc castaneous with two large semilunar markings, testaceous. Tegmina clear hyaline, the veins testaceous, veins of discoidal area oblique, reticulated. Abdomen beneath testaceous, margined with fuscous; cerci testaceous. Legs testaceous.

62. *Prosoplecta quadriplagiata*, Wlk.

*Prosoplecta quadriplagiata*, Walker, l. c. p. 189 (1868).

♂. Batchian (*Wallace*).

63. *Prosoplecta gutticollis*, Wlk.

*Prosoplecta gutticollis*, Walker, l. c. p. 189 (1868).

♀. Ceram (*Wallace*).

In this species the sub-genital lamina is relatively enormous occupying nearly half the total length of the abdomen.

64. *Prosoplecta trifaria*, Wlk.

*Prosoplecta trifaria*, Walker, l. c. p. 190 (1868).
*Prosoplecta megaspila*, Walker, l. c. p. 190 (1868).

♂. (*trifaria*). Batchian (*Wallace*).
♀. (*megaspila*). Batchian (*Wallace*).

Sub-fam. *PERISPHÆRIINÆ.*

65. *Aptera rubricosa*, Wlk.

*Nauphœta rubricosa*, Walker, l. c. p. 185 (1868).

♂. S. Africa.

Synonymous with *A. cingulata*, Burm.

66. *Perisphæria flexicollis*, Wlk.

*Zetobora flexicollis*, Walker, l. c. p. 187 (1868).

♂. Singapore (*Wallace*).

This may well be the male of one of the Indo-Malayan species that have been described from female examples only. It is apparently most closely allied to *P. fornicata*, Br. from Burma, but is larger.

Total length 25 mm. ; length of body 22 mm. ; length of tegmina 19 mm. ; pronotum 7 mm. × 10 mm.

67. *Hostilia cervina*, Wlk.

*Zetobora cervina*, Walker, l. c. p. 186 (1868).
? *Zetobora congrua*, Walker, l. c. p. 49 (1868).
*Zetobora carinata*, de Saussure, Mél. Orth. iv, p. 139, Pl. x, f. 50 (1873).

♂. Natal.

68. *Hyposphæria leucopthalma*, Wlk.

*Zetobora leucopthalma*, Walker, l. c. p. 186 (1868).

♂. Natal.

According to Kirby, who has compared the types, this is synonymous with *H. tenebrosa*, Wlk., a species placed by Walker in the genus *Panchlora !* It is somewhat doubtful if *tenebrosa*, Wlk. is not the same as *H. stylifera*, Br., but the wings are different in colour, and I hesitate to merge the species without comparing the types. *H. ruficornis*, Sss. and Zhnt. is also closely allied but can be distinguished by the colour of the antennæ.

69. *Blepharodera pilipes*, Wlk.
*Panchlora pilipes*, Walker, l. c. p. 184 (1868).

♂. Cape of Good Hope.

According to Kirby, who has compared the types, this is the equivalent of *B. contusa*, Wlk. (l. c. p. 30, 1868), and it is probable that it is synonymous with *B. pilifera*, Stål, the description of which is rather brief.

70. *Hormetica subcincta*, Wlk. (Plate XXX, fig. 8.)
*Brachycola subcincta*, Walker, l. c. p. 188 (1868).

♂. Colombia.

Allied to *H. verrucosa*, Br. Head testaceous with a large black marking on the front, extending to base of clypeus ; labrum, palpi and antennæ fusco-castaneous. Pronotum as in *H. verrucosa* but not bordered with black. Tegmina short, transversely truncate, not extending beyond the second abdominal segment, colour and markings as in *H. verrucosa*. Abdomen black, bordered above with testaceous, supra-anal lamina testaceous, sub-genital lamina rufo-castaneous, cerci black tipped with testaceous.

Total length 31 mm. ; length of tegmina 9 mm. ; pronotum 12 mm. × 18 mm.

The female has the abdomen above coloured as in the male, whereas in *H. verrucosa*, Br. ♀, the abdomen has transverse testaceous bands above and marginal testaceous spots below. The species varies considerably in size.

71. *Hormetica interna*, Wlk.
*Brachycola interna*, Walker, l. c. p. 188 (1868).

♂. Nauta (*Bartlett*).

Allied to the preceding species but the head not so heavily marked with black, the pronotum more punctate, the tegmina with a large semicircular band castaneous in colour, abdomen beneath margined with testaceous.

Total length 27 mm. ; length of tegmina 11 mm. ; pronotum 10 mm. × 15 mm.

Of the seventy-seven species in Mr. Saunders' collection described by Walker, fifty-seven can stand as distinct species

the remainder must be sunk as synonyms of previously described species; one of Walker's species it has been found necessary to separate into two. The following table gives the revised nomenclature of these species, which are now arranged in the order adopted by Walker in his "Catalogue of Blattidæ":—

| Walker's Nomenclature. | Revised Nomenclature. |
|---|---|
| *Polyphaga silphoides* | *Dyscologamia silphoides*, Wlk. |
| *Panchlora pilipes* | *Blepharodera contusa*, Wlk. |
| *Nauphœta guttulosa* | *Tribonium guttulosum*, Wlk. |
| *Nauphœta rubricosa* | *Aptera cingulata*, Burm. |
| *Zetobora leucopthalma* | *Hypospharia tenebrosa*, Wlk. |
| *Zetobora cervina* | *Hostilia cervina*, Wlk. |
| *Zetobora flexicollis* | *Perisphæria flexicollis*, Wlk. |
| *Zetobora pilosa* | *Dyscologamia pilosa*, Wlk. |
| *Brachycola interna* | *Hormetica interna*, Wlk. |
| *Brachycola subcincta* | *Hormetica subcincta*, Wlk. |
| *Prosoplecta quadriplagiata* | *Prosoplecta quadriplagiata*, Wlk. |
| *Prosoplecta gutticollis* | *Prosoplecta gutticollis*, Wlk. |
| *Prosoplecta trifaria* | *Prosoplecta trifaria*, Wlk. ♂. |
| *Prosoplecta megaspila* | *Prosoplecta trifaria*, Wlk. ♀. |
| *Euthyrrapha dasytoides* | *Corydia dasytoides*, Wlk. |
| *Euthyrrapha dasytoides*, var. | *Corydia ænea*, Br. |
| *Euthyrrapha ipsoides* | *Euthyrrapha pacifica*, Coq. |
| *Holocompsa debilis* | *Holocompsa debilis*, Wlk. |
| *Stenoblatta parallela* | *Stenoblatta parallela*, Wlk. |
| *Epilampra polyspila* | *Molytria maculata*, Br. |
| *Epilampra inclarata* | *Epilampra inclarata*, Wlk. |
| *Epilampra conformis* | *Pseudophoraspis nebulosa*, Burm. |
| *Epilampra scita* | *Pseudophoraspis nebulosa*, Br. |
| *Epilampra plena* | *Epilampra plena*, Wlk. |
| *Epilampra ferrida* | *Epilampra plena*, Wlk. |
| *Epilampra dotata* | *Molytria badia*, Br. |
| *Epilampra varia* | *Epilampra varia*, Wlk. |
| *Epilampra adusta* | *Homalopteryx adusta*, Wlk. |
| *Epilampra basifera* | *Homalopteryx macassariensis*, Haan. |
| *Epilampra ramifera* | *Molytria ramifera*, Wlk. |
| *Epilampra parvicollis* | *Hedaia parvicollis*, Wlk. |
| *Epilampra concinnula* | *Hedaia concinnula*, Wlk. |
| *Pseudomops inclusa* | *Pseudomops inclusa*, Wlk. |
| *Pseudomops scutigera* | *Pseudothyrsocera scutigera*, Wlk. |
| *Pseudomops fissa* | *Hemithyrsocera histrio*, Burm. |
| *Pseudomops pica* | *Pseudothyrsocera pica*, Wlk. |
| *Ellipsidium speciosum* | *Thyrsocera speciosa*, Wlk. |
| *Blatta calogramma* | *Chorisoneura calogramma*, Wlk. |
| *Blatta fragilis* | *Chorisoneura nigrifrons*, Serv. |
| *Blatta glabricula* | *Chorisoneura discoidalis*, Burm. |
| *Blatta annulicornis* | *Phyllodromia annulicornis*, Wlk. |
| *Blatta erythrina* | *Ischnoptera rufa*, Br. |
| *Blatta extenuata* | *Phyllodromia supellectilium*, Serv. |

| Walker's Nomenclature. | Revised Nomenclature. |
|---|---|
| *Blatta colligata* | *Phyllodromia colligata*, Wlk. |
| *Blatta polygrapha* | *Phyllodromia polygrapha*, Wlk. |
| *Blatta suffusa* | *Phyllodromia suffusa*, Wlk. |
| *Blatta amplectens* | *Phyllodromia amplectens*, Wlk. |
| *Blatta hamifera* | *Phyllodromia hamifera*, Wlk. |
| *Blatta ignobilis* | *Phyllodromia ignobilis*, Wlk. |
| *Blatta funebris* | *Phyllodromia funebris*, Wlk. |
| *Blatta palpalis* | *Duryodana palpalis*, Wlk. |
| *Blatta obtusifrons* | *Phyllodromia obtusifrons*, Wlk. |
| *Blatta elegans* | *Phyllodromia elegans*, Wlk. |
| *Blatta apicigera* | *Theganopteryx apicigera*, Wlk. |
| *Blatta propinqua* | *Phyllodromia propinqua*, Wlk. |
| *Blatta contigua* | *Phyllodromia propinqua*, Wlk. |
| *Blatta contingens* | *Phyllodromia contingens*, Wlk. ♀. |
| *Blatta sequens* | *Phyllodromia sequens*, Wlk. |
| *Blatta guttifera* | *Phyllodromia guttifera*, Wlk. |
| *Blatta xanthopila* | *Pseudothyrsocera xanthophila*, Wlk. |
| *Blatta laterifera* | *Phyllodromia laterifera*, Wlk. |
| *Blatta virescens* | *Phyllodromia virescens*, Wlk. |
| *Blatta majuscula* | *Phyllodromia majuscula*, Wlk. |
| *Blatta marmorata* | *Phyllodromia marmorata*, Wlk. |
| *Blatta humeralis* | *Phyllodromia contingens*, Wlk. ♂. |
| *Blatta picticollis* | *Phyllodromia picticollis*, Wlk. |
| *Blatta bipunctata* | *Pseudectobia bipunctata*, Wlk. |
| *Blatta laticeps* | *Pseudophyllodromia laticeps*, Wlk. |
| *Blatta circumducta* | *Escala circumducta*, Wlk. |
| *Blatta longiuscula* | *Escala longiuscula*, Wlk. |
| *Blatta patula* | *Allacta mundicola*, Wlk. ♀. |
| *Blatta latirupta* | *Allacta mundicola*, Wlk. ♂. |
| *Ischnoptera reversa* | *Ischnoptera reversa*, Wlk. |
| *Ischnoptera conferta* | *Leucophæa conferta*, Wlk. |
| *Ischnoptera ? obliqua* | *Pinaconota obliqua*, Wlk. |
| *Ischnoptera ? punctosa* | *Oniscosoma punctosa*, Wlk. |
| *Periplaneta aterrima* | *Pelmatosilpha aterrima*, Wlk. |
| *Periplaneta oculata* | *Methana oculata*, Wlk. |

## VI. Viviparity amongst the *Blattidæ*.

Attention was first called to this phenomenon amongst the *Blattidæ* by Riley ("Insect Life," vol. iii, p. 443, 1890–1891 and vol. iv, p. 119, 1892), who observed it in *Panchlora viridis*, Burm. Scudder had already noted (Psyche, vol. v, p. 405, 1890) the occurrence of a female specimen of *Panchlora nivea*, L., found alive in a bath-room at Salem, Mass., surrounded by numerous newly-hatched young, but he had not been able to demonstrate the actual birth of these young. Riley dissected one of

his specimens and found that it contained a perfect egg-cluster of crescentic form, the eggs to the number of forty-four and in different stages of development being arranged in a double row. The egg-mass was contained in a thin-walled prolongation of the genital pouch, which may be termed the brood sac. Whilst in most cockroaches the egg-capsule is a horny structure, in *Panchlora viridis* it is a fine membranous sheath enclosing only the basal half of the egg-mass. The colleterial glands have always been regarded as secreting the substance of the horny ootheca of *Blattidæ*, and Riley assumed that they are absent or much reduced in *Panchlora viridis* but did not test the truth of his assumption by dissection. From another specimen examined by Riley young larvæ and nearly mature embryoes had been extruded.

Holmgren in a paper on viviparity amongst insects in general (Zool. Jahrb. Syst. xix, p 434,) records viviparity for three more genera of *Blattidæ*, viz. *Eustegasta micans*, Sss. and Zhnt., *Oxyhaloa saussurei*, Borg, and an undetermined species of *Blabera*. In the latter species the developing eggs are contained in a horny and sculptured capsule which lies in a thin-walled brood-sac and is apparently retained there till the eggs are mature or nearly so. In *Eustegasta micans* the ootheca splits open whilst still in the brood-sac, and the young larvæ emerge two by two from the mother. Holmgren divides *Blattidæ* into three sections according to their method of reproduction, as follows:—

1. Oviparous species, which carry the ootheca for some days protruding from the tip of the abdomen.
Ex. *Periplaneta.*

2. Viviparous species, the ootheca retained within a brood-sac.
Ex. *Eustegasta, Oxyhaloa, Blabera.*

3. Viviparous species, the ootheca practically absent.
Ex. *Panchlora.*

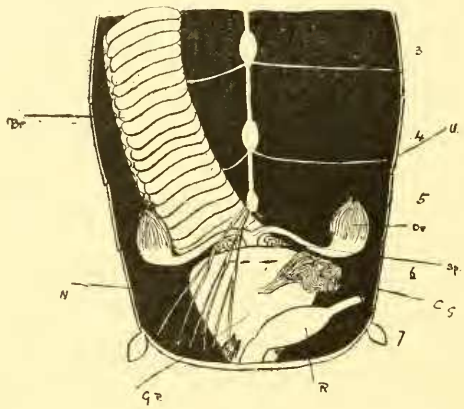
To this last section and possibly to the second I am able to add more examples.

My own attention was specially drawn to this phenomenon of viviparity amongst *Blattidæ* in rather an interesting manner. Whilst arranging the South

American species of *Epilampra* in the Hope Museum, Oxford, I had occasion to examine closely a series of specimens of *Epilampra burmeisteri*, Guér., collected in Brazil by the distinguished traveller, W. J. Burchell, and I observed that one female example had been preserved with two young larvæ actually emerging from the tip of the abdomen, and that they were still partially shrouded in some shreds of the embryonic membranes. The specimen is numbered "1400" and is the only one of the series that does bear a number. Those who have had occasion to study Burchell's collections know that he attached numbers to the specimens that were of special interest to him and his observations on such specimens were recorded in his note-books under corresponding numbers. Unfortunately Burchell's note-books with records of specimens numbered from 1345 onwards are lost, but we can be tolerably sure that the young larvæ emerging from the abdomen of his specimen No. 1400 did not escape the notice of this keen observer and that the specimen was consequently numbered and the fact actually recorded. To Burchell then may well be accorded the credit of first discovering the phenomenon of viviparity in *Blattidæ*.

In Sarawak, Borneo, I captured a female of *Pseudophoraspis nebulosa*, Burm., with numerous young larvæ clinging to the under surface of the abdomen, and in the Hope Museum is a female of *Phlebonotus pallens*, Serv., with the following label attached:—"Ceylon. J. Staniforth Green. Carries its live young beneath its wing-covers. 1878." In the females of this species the tegmina are large and convex, the wings somewhat reduced and the abdomen above is concavely depressed, so that a brood-chamber is formed under the tegmina in which there is ample room to accommodate several young larvæ. It is hardly reasonable to suppose that these two species of *Epilamprinæ* deposit an ootheca containing newly-fertilized eggs and stay beside the ootheca until the young larvæ hatch out and return to the mother from whom they originated. It is, on the contrary, in the highest degree probable that the eggs are retained in the body of the mother until they attain maturity, but whether they are enclosed in a horny ootheca lying in a brood-sac or whether the ootheca is absent or much reduced as in *Panchlora viridis* is not known. I have dissected the female *Pseudophoraspis nebulosa* that I captured with her

young and find that below the genital pouch lies a forward prolongation of it with rather thick walls; this is the brood-sac and as it is not much larger than the genital pouch itself and much smaller than the brood-sac in *Panchlora viridis* and in *Molytria maculata* and *Panesthia javanica*, as described below, it is rather difficult to explain its function, unless one supposes that it becomes very much dilated as the fertilized eggs pass into it from the uterus, its walls then becoming membranous and the whole organ pushing forward to lie amongst the abdominal viscera as is the case in other viviparous species. The brood-sac was empty in the specimen examined; the genital pouch




Dissection of *Panesthia javanica*, ♀, showing brood-sac, etc.

3–7 = Nos. of segments.
R. = Rectum.
G.P. = Genital pouch.
C.G. = Colleterial gland.
Sp. = Spermatheca.
U. = Uterus.
Ov. = Ovary.
Br. = Brood-sac.
N. = Branches of ventral nerve-cord.

had thick muscular walls, and when opened the four finger-like gonapophyses were seen attached to the dorsal wall and directed backwards; in the ventral wall was seen the orifice leading to the brood-sac and lying at the bottom of a depression in the wall of the pouch. The right colleterial gland was well developed, but the left one was aborted.

In *Panesthia javanica*, Serv., the egg-mass, which is about 18 mm. long, is contained in a thin-walled brood-sac lying asymmetrically on the left side of the abdomen

and extending as far forward as the third abdominal sternite; this brood-sac is, as in the other viviparous species, connected with the genital pouch. The eggs number from 36 to 40 and are retained in the brood-sac until mature; they do not form a crescentic mass as in *Panchlora viridis*. The left colleterial glands are absent, but those on the right are well developed. It is by no means clear that these glands secrete the chitinous ootheca of *Periplaneta*, etc.; it is remarkable to find that on one side at least they are well developed in a species whose eggs are enclosed in a thin membrane. I have not been able to dissect *Molytria maculata*, Br., as I have nothing but dried specimens, but I have frequently removed egg-masses in all stages of development from the brood-sacs of freshly-killed females during my sojourn in the Eastern tropics and I have several of these egg-masses in my possession now; they are larger than those of *Panesthia javanica*, but otherwise show no differences worth considering at present. I hope ere long to study the embryonic development of these two viviparous genera *Panesthia* and *Molytria*; it is possible that it differs considerably from that of oviparous species. Viviparity is now known to occur in six of the eleven sub-families of *Blattidæ*, viz. *Epilamprinæ* (4 genera), *Panchlorinæ*, *Blaberinæ*, *Oxyhaloinæ*, *Perisphæriinæ*, *Panesthiinæ* (one genus each), and is consequently of more usual occurrence than was suspected; I think it likely that it will be shown eventually that it occurs almost, if not quite, universally amongst the *Epilamprinæ*. *Eustegasta* is a genus placed by all authors in the *Perisphæriinæ*, but in the majority of its characters it is much more closely allied to the *Epilamprinæ* than to the other members of the *Perisphæriinæ* and it is of interest that viviparity occurs in this genus.

Note.—Just before going to press I received alive a female specimen of *Panchlora virescens*, Thunb., and some females of *Phyllodromia germanica*, L. Mr. H. Main, to whom I am indebted for the latter specimens, informs me that *P. germanica* ♀ carries the egg-capsule protruding from the tip of the abdomen for some weeks and deposits it only one or two days before the contained young hatch out. I was surprised to observe in the living female of *Panchlora virescens* an egg-mass partially protruding from the end of the abdomen; so far as can be determined

by a superficial examination the eggs are not in a very advanced state of development; in this specimen the egg-mass is so large that it cannot be retained entirely in the brood-sac; the ootheca is represented by a thin transparent membrane, which however is complete, not incomplete as in the species observed by Riley. In an undescribed species of *Temnopteryx* from East Africa, the female carries the eggs contained in a transparent membrane protruding from the end of the abdomen; in the only example examined the eggs are very advanced in development. These new facts enable me to modify Holmgren's "series" of *Blattidæ* as follows :—

1. Oviparous species. Eggs enclosed in a chitinous ootheca and carried by the female for a short time only.
Ex. *Ectobia, Blatta, Periplaneta.*

2. Ovo-viviparous species. (*a*) Eggs enclosed in a semi-chitinous capsule and carried by the female, protruding from the abdomen during the greater part of the embryonic period.
Ex. *Phyllodromia germanica.*

(*b*) As above, but eggs enclosed in a transparent membrane.
Ex. *Temnopteryx* sp.

3. Viviparous species. (*a*) Eggs enclosed in a chitinous ootheca which is retained in the brood-sac of the mother. Ex. *Oxyhaloa saussurei, Eustegasta micans, Blabera* sp. [?*Pseudophoraspis nebulosa* and *Phlebonotus pallens*]. (*b*) Eggs enclosed in a transparent membrane, which is retained in the brood-sac of the mother. i. Membrane complete. Ex. *Molytria maculata, Epilampra burmeisteri, Panchlora virescens, Panesthia javanica* [? *Pseudophoraspis nebulosa* and *Phlebonotus pallens*]. ii. Membrane incomplete. *Panchlora viridis, P. nivea.*

## VII. A New Genus of Symbiotic *Blattidæ*.

### Genus *Sphecophila*, nov.

Superficially resembling *Attaphila*, Wheel., but tegmina absent in the male; subgenital lamina of male provided with two styles; femora unarmed beneath; no arolia between tarsal claws; frons swollen; eyes reduced; ocelli present; antennæ short, but conforming to normal Blattid type.

The only known species was taken from the nest of the wasp, *Polybia pygmæa*, Fab., in French Guiana.

We have in this little cockroach an example of the difficulties which beset the systematist when he has to deal with aberrant species modified by peculiar habits and environment to a similar general facies.

The genus *Attaphila* contains two species of myrmecophilous cockroaches, *A. fungicola*, Wheel., and *A. bergi*, Bol., found respectively in the nests of *Atta fervens*, Say, in Texas, and *Atta lundi*, Guèr., in Uruguay. Wheeler, who first made known the genus (Amer. Nat. vol. xxxiv, p. 851, 1900), suggests that among the Blattidæ it occupies "a peculiar if not unique taxonomic position;" and Bolivar (Comm. del. Mus. Nac. d. Buenos Aires, p. 333, 1901) creates for its reception the sub-family Attaphilinæ, regarding the peculiar antennal characters of high importance. This sub-family takes its place in the first of the two great divisions in which the Blattidæ have been brigaded, viz. that in which the femora are spined beneath. *Sphecophila* cannot be placed in this division, for the femora are unarmed beneath; much less then can it be placed in the sub-family Attaphilinæ, though its general resemblance to *Attaphila* is most striking. Must then a new sub-family be created for the reception of *Sphecophila*? I think not; the multiplication of sub-divisions for the reception of anomalous genera is a practice to be deprecated for many reasons, chief among which is the consideration that it tends to obscure the relationships which must exist between these anomalous genera and genera of more normal type. In my opinion *Attaphila* may be regarded as an aberrant Phyllodromiine, akin to *Loboptera*, Br., or *Temnopteryx*, Br., and *Sphecophila* as an aberrant member

of the sub-family Corydiinæ (= Heterogamiinæ). Bolivar (l. c.) is much impressed by the structure of the antennæ in *Attaphila*, the increasing lengths of the joints in proportion to their breadth particularly attracting his attention, and he states that in all other Blattidæ the joints of the antennæ, with the exception of the first, are short and transverse. This as a matter of fact is scarcely accurate; in cockroaches of normal type the first joint of the antennæ is longer than broad, the second usually broader than long, and the third much longer than broad; the succeeding joints are short and transverse but gradually increasing in length until they are longer than broad, and the apical joints are usually sub-moniliform. *Attaphila* is peculiar in that the third joint of the antennæ is short and transverse and the increase in length of the succeeding joints is not gradual but sudden. Unfortunately in all the specimens of *Attaphila* that have been examined, the antennæ are mutilated, so we know nothing of the terminal ends of these organs. Wheeler examined forty-five examples of *A. fungicola*, and found that in seventeen specimens the mutilation of the antennæ was symmetrical, in twenty-one specimens almost symmetrical, the difference being not more than one joint; in only seven specimens were the antennæ very asymetrically mutilated. He concludes that the ants, with which this cockroach lives, crop the antennæ of their guests and suggests that the peculiar structure of the antennæ is a result of continual clipping. Without subscribing to this opinion, it may be pointed out that a modification of the antennæ of an insect living in the dark and under very peculiar circumstances is rather to be expected; indeed, it might be expected that profound modifications of the antennæ would invariably accompany a marked reduction of the other sense-organs, the eyes, if *Sphecophila* was not a standing proof to the contrary. *Attaphila*, as shown by an examination of the contents of the alimentary canal, feeds on the fungus cultivated by the leaf-cutting ants; *Sphecophila* is nourished otherwise. The wasps of the genus *Polybia* construct small paper nests pendant from the under surface of leaves or twigs; in some species the nest is made up of a number of cells without any outer common covering; every cell containing a larva is open at the lower end, and it is only the cells containing nymphs that are closed, each with a paper cap. *Polybia pygmæa* however constructs a nest composed of a

number of cells enclosed in a common covering of paper, and the entrance to the nest is by one orifice in the floor of the nest. The mother wasp feeds the larvæ with insects or spiders that she brings to them, and it is probable that the symbiotic cockroaches living on the floor of the nest feed on any small fragments of food that may drop down from the wasp-larvæ in the cells above. I owe this suggestion to my friend Vicomte R. du Buysson, who discovered the cockroaches in the nest of the *Polybia*, which was sent home by the collector, M. F. Geay. In conclusion, we may regard these two genera, *Attaphila* and *Sphecophila*, as affording an admirable demonstration of convergence in development, a result which we may fairly assume to have been brought about by very similar modes of life, viz. symbiosis with social Hymenoptera. The following tables show more graphically the similarities between the two genera and their dissimilarities, and it will be seen that whilst the former are in the main superficial and obvious, the latter are deep-seated and of great taxonomic importance, showing that the genera have arisen from totally different stocks.

*Features common to the two genera:—*

Colour.
Pubescence.
Size.
Shape.
Reduction of eyes.
Vertex not covered by pronotum.
Shortness of legs.
One-jointed cerci.

*Differences between the two genera:—*

| Attaphila. ♂. | Sphecophila. ♂. |
|---|---|
| Third antennal joint short. | Third antennal joint long. |
| Ocelli absent. | Ocelli present. |
| Tegmina and wings present. | Tegmina and wings absent (? in nymphs only). |
| Supra-anal lamina trigonal. | Supra-anal lamina semi-orbicular. |
| Styles absent. | Styles present. |
| Femora armed beneath. | Femora unarmed beneath. |
| Tarsal arolia present. | Tarsal arolia absent. |

*Spheeophila polybiarum.* (Plate XXX, figs. 10–12.)

♂. Fulvo-testaceous, with a fine fulvous pubescence. Vertex not covered by the pronotum; front of head swollen and projecting as is common amongst the Corydiinæ; eyes very much reduced, scarcely visible from the front and almost entirely hidden under the deflexed sides of the pronotum; one pair of true ocelli situated low down on the frons and closer together than the antennal sockets; maxillary and labial palpi small. Antennæ short, of twenty joints, the first joint longer than broad, the second as broad as long, the third longer than broad, the remaining joints at first broader than long, but gradually becoming longer, the last four or five joints almost moniliform. Pronotum with anterior and posterior margins truncate, narrower in front than behind, longer than broad, sides deflexed; meso- and metanotum broader than long, their posterior angles only slightly produced backwards. Nine abdominal tergites, including the supra-anal lamina, are visible, posterior margins of the first three and of the eighth straight, of the fourth to the seventh concave; the supra-anal lamina is semi-orbicular. Cerci one-jointed, acute, equal to the supra-anal lamina in length. Eight abdominal sternites, including the sub-genital lamina, are visible; sub-genital lamina slightly produced, not extending as far as the supra-anal lamina, with one pair of styles equalling in length the cerci and clothed with a few erect hairs. Femora without spines, on the anterior margin beneath of the front femur is a row of stiff setæ, a genicular spine on each femur, no apical spines. Spines on tibiæ above in three rows, five apical spines on the posterior tibiæ. Metatarsus longer than the remaining joints, no arolium between claws.

♀ unknown.

Total length 3 mm. – 3·2 mm.

Ste. Marie, Oyapock, French Guiana (F. Geay, 1900). Ten examples (Paris Museum); from the nest of *Polybia pygmæa,* Fab.

The absence of female examples is striking, but it is possible that the entire colony was not secured by the collector, some individuals may have escaped from the nest. I cannot be certain that the specimens here described are fully adult, but I am inclined to think that they are, or if not, that the adults are apterous, for nymphs of winged cockroaches have the posterior angles of the mesonotum and metanotum much more strongly produced backwards than is the case in the specimens before me.

## Explanation of Plate XXX.

Fig. 1. Supra-anal lamina of *Pseudothyrsocera xanthophila*, Wlk., ♂.
2. Sub-genital lamina of *Pseudothyrsocera xanthophila*, Wlk., ♂.
3. *Pseudectobia bipunctata*, Wlk., ♀ × 3.
4. Sub-genital lamina of *Phyllodromia contingens*, Wlk., ♂.
5. *Pinaconota obliqua*, Wlk., ♂. Slightly enlarged.
6. *Homalopteryx adusta*, Wlk., ♀. Slightly enlarged.
7. *Stenoblatta paralella*, Wlk., ♀. Slightly enlarged.
   *a*. side view.
8. *Hormetica subcincta*, Wlk., ♀. Slightly enlarged.
9. *Epilampra varia*, Wlk., ♀. Slightly enlarged.
10. Head of *Sphecophila polybiarum*, mihi, ♂ × 35.
11. Supra-anal lamina of *Sphecophila polybiarum*, mihi, ♂ × 25.
12. Sub-genital lamina of *Sphecophila polybiarum*, mihi, ♂ × 25.